Training Public Health Students to Investigate Disease Outbreaks—Examples of Community Service

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Synopsis

In a cooperative effort among the Centers for Disease Control, the Yale University Department of Epidemiology, and the Connecticut State Department of Health Services, an epidemiology demonstration training program was established in which student-faculty rapid response teams responded to requests from the State and from local health departments to investigate acute disease outbreaks or the health effects of natural experiments. Over five academic semesters, 23 teams, consisting of a total of 76 students, responded to requests and produced reports regarding the etiology and recommendations for control to the appropriate agencies. By the end of the fifth semester, there had been three papers or reports published in medical or public health journals, two papers accepted for publication, four presentations at meetings, and five additional manuscripts had been submitted to journals or were being prepared for submission. Throughout the experience, a high level of cooperation between local and State health departments and the school of public health was maintained. Involved students, faculty, and State investigators believed the experience to be highly productive and worthwhile.

ALTHOUGH MOST PUBLIC health students in the United States are introduced to epidemiologic concepts that are applied to investigations of disease outbreaks, few have the opportunity to plan and participate in actual outbreak investigations or to recommend and evaluate measures for disease control that are based on the results of their investigations. A project conducted at the Department of Epidemiology and Public Health, Yale University School of Medicine (Yale), in cooperation with the Centers for Disease Control (CDC), and the State of Connecticut Department of Health Services (CT-DHS) has sought to demonstrate that experience in field epidemiology can be provided to many public health students. This report describes the first 2 years of the project.

Background and Methods

As part of a larger cooperative project with the Association of Schools of Public Health, in January 1984, the Centers for Disease Control (CDC) requested proposals to use an experienced medical epidemiologist to assist a school of public health to demonstrate ways to increase the contact and cooperation between schools of public health, on the one hand, and local and State health departments, on the other. Yale University School of Medicine's Department of Epidemiology and Public Health (an accredited school of public health) proposed a program to improve control of health problems by providing student-faculty teams to assist health departments to investigate disease outbreaks. The project was awarded to Yale because of the scientific merit of the proposed program and its technical feasibility due to the department's good communication with the CT-DHS and with local health departments.

The project began in November 1984. As its centerpiece, Yale developed student-faculty "rapid response teams" (RRT) to respond to local concerns about possible outbreaks of disease. Usually

the first contact was to the CT-DHS, but sometimes local health departments telephoned faculty members at Yale responsible for the program. If there was a possibility of a problem that should be investigated, the State Epidemiologist was contacted and, under his direction, a program faculty member chose a team of students (usually three students per team) from an on-call list. The team thus created worked with the CT-DHS and the requesting agency to perform an initial assessment. The students were then responsible for presenting an initial report to the State Epidemiologist or his deputy. If the situation warranted thorough investigation, and the State Epidemiologist approved, the RRT proceeded to complete the investigation and make a complete report, including both oral and written presentations to Yale faculty, to CT-DHS personnel and, often, to the affected institution or community.

To be a member of an RRT a student had to enroll in a one-semester course entitled "Investigation of Disease Outbreaks." The course consisted of three components: (*a*) weekly seminars and readings designed to help prepare students to assist in outbreak investigations, (*b*) actual investigations throughout the semester, and (*c*) oral and written presentations of the investigation findings and recommendations for control. Available to the students was a reference shelf with copies of past investigation reports, sample instruments, and various reference materials. The course was designed for students from all divisions of the School of Public Health as well as preventive medicine residents. In the weekly seminars, case-problem discussions of the actual field investigations emphasized the importance of timely reporting of all findings to appropriate health department personnel and of maintaining strict confidentiality. Students were instructed to refer any questions from news media representatives to CT-DHS staff. At the conclusion of an investigation, data collected and records developed during the field work were kept at the CT-DHS.

RRT investigations were designed and timed to suit the circumstance of the request. Students participated in each step of an investigation: establishing the definition of a case and determining whether or not an outbreak was occurring; characterizing the cases using time, place, and person and reviewing pertinent literature to generate hypotheses; testing the hypotheses to identify risk factors; and recommending control measures to appropriate State and local officials. The use of surveillance data was emphasized in every step of disease investigation.

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Example of an Investigation

The following example illustrates how one RRT investigation developed. On January 30, 1985, the CT-DHS requested assistance from a RRT to investigate cases of influenza-like illness (ILI) in a nursing home. That day a team was selected and its three members began reviewing literature about outbreaks of influenza in institutions. On January 31 the student-faculty team joined an epidemiologist from CT-DHS at the facility to begin the investigation. After an introductory conference and walk-through of the facility with key nursing home staff, the investigators reviewed daily illness logs maintained by the infection control nurse; established a definition for ILI; drew preliminary epidemic curves based on time, place, and person from information about cases found on daily logs; and developed a form to collect further information about all nursing home residents. While student investigators reviewed medical records of the 85 residents, the CT-DHS epidemiologist collected blood and throat wash diagnostic specimens and helped implement infection control procedures to limit further spread of ILI in the facility.

By mid-afternoon on February 1 the record review was completed, and preliminary analysis suggested that residents who had received the 1984–85 influenza vaccine were as likely as unvaccinated residents to have ILI. This finding and recent documentation in Connecticut of illness caused by influenza A virus led to a recommendation of amantadine hydrochloride prophylaxis for residents who had not yet had ILI. Only three further cases were noted during the following 2 weeks, when the student investigators maintained careful surveillance by telephone and intermittent visits to the facility and analyzed the field investigation data with a personal computer at Yale. Serologic and viral isolate results confirmed that the ILI was caused by an influenza A (H3N2)

Problems investigated by student-faculty rapid response teams, source of request, and resulting publications and presentations during five semesters, Department of Epidemiology and Public Health, Yale University

1. Unexplained skin rash at a large chronic disease hospital (1 team—State Epidemiologist)
2. Outbreaks of influenza A, 3 different nursing homes (3 teams—State Epidemiologist, local health director, director of nursing) report in MMWR 34: 478-482, Aug. 9, 1985, 1 paper in preparation
3. Several reported cases of gonorrhea in children, Connecticut city (1 team—local health director) report in Pediatrics 78: 509-510 (1986)
4. Hepatitis A outbreak involving food service workers at a large hotel (1 team—local health director) presented at 1986 New England Public Health Association meeting
5. Giardiasis in a rural community (1 team—State Epidemiologist) presented at 1986 New England Public Health Association meeting and the 1986 National Environmental Health Association meeting
6. Hurricane-related injuries (2 teams—State Epidemiologist, mayor of an affected city) report in MMWR 35: 765-770, Jan. 3, 1986; presented at 1986 National Environmental Health Association meeting, 2 papers accepted for publication
7. Comparison of the surveillance of campylobacteriosis in 2 Connecticut towns (1 team—local pathologist and State Epidemiologist)
8. Outbreak of influenza B followed by an outbreak of influenza A in a nursing home (2 teams—infection control nurse and State Epidemiologist)
9. Employee attitudes toward a new restrictive company smoking policy (2 teams—State Epidemiologist) 1 paper submitted for publication and another paper in preparation
10. Are synthetic opiates being used by IV drug users in Connecticut? (1 team—State Epidemiologist)
11. Health effects of hyperfluoridation of a community water supply (1 team—State Epidemiologist) 1 paper in preparation, 1 presentation at a regional epidemiology meeting
12. Increased reporting of hepatitis A in 2 Connecticut cities (1 team—local health directors)
13. Outbreak of shigellosis in an institution for the mentally retarded (1 team—State Epidemiologist)
14. Knowledge and attitudes about AIDS of public safety workers in a Connecticut city (1 team—local health director) 1 paper in preparation
15. Outbreaks of viral gastroenteritis, 2 Connecticut nursing homes (2 teams—State Epidemiologist)
16. Outbreak of salmonellosis at a Connecticut restaurant (1 team—State Epidemiologist)
17. Surveillance of cocaine admissions, emergency room of a Connecticut hospital (1 team—program director)

virus. By the end of the academic semester in May, the student team had presented written and oral reports of the results of the investigation at Yale and CT-DHS. In addition, this team and two others that had investigated influenza A outbreaks in two other Connecticut nursing homes had submitted their findings to the Morbidity and Mortality Weekly Report (*1*).

Results and Discussion

Epidemiologic techniques for investigating disease outbreaks have been taught, in large part, at schools of public health and schools of medicine by simulating field conditions with classroom discussions (*2*) or by arranging field tutorials for individual students (*3,4*). The Yale program sought to provide practical training in the field by a collaborative arrangement between a school of public health and State and local health departments.

The program has four objectives, each of which is being achieved.

Education. During the first 5 semesters of the program, 23 teams consisting of 76 students responded to requests from State and local authorities to assist with investigations of both communicable and noncommunicable disease problems (see box). Three students who had completed the course assisted teams conducting field investigations in subsequent semesters, and two students used the results of their investigation to write their master of public health theses. Every team gave oral presentations of the results of its investigation to students and faculty at Yale; 10 teams presented reports to staff at State or local health departments or both; 2 teams gave presentations at the

1986 New England Public Health Association meeting; and 3 teams presented to attendees at the 1986 National Environmental Health Association Meeting.

Service. The program's second objective is to increase the cooperation between schools of public health and State and local health departments by providing the departments with a pool of investigators who can respond on short notice to give temporary assistance in investigating possible outbreaks. The 23 collaborative investigations are evidence of student-faculty-health department cooperation which occurred because of the program. One measure of the acceptability of student teams by health departments is the number of requests received. A major concern when the program began was whether there would be enough requests to use all the students who enrolled in the course. This was not a problem. In each semester the requests received exceeded the number of student teams available, despite the fact that the course was persistently over-subscribed. (The course was planned for up to 12 students, but an average of 15 have enrolled each semester.)

One reason for an abundance of requests from the community is that the readily available student teams allow a health department to investigate situations, such as hurricane-related injuries or public safety workers' knowledge about AIDS, that might not otherwise be investigated due to staffing limitations. Also, results of an initial investigation sometimes led to additional investigations; this happened with the study of employees' attitudes towards a change in a company's smoking policy.

Science. The third objective is to add to the science of public health. Results of three investigations by six student teams have been published, and at least seven additional manuscripts are being prepared for consideration by journals (see box). However, the quantity of publications is an insufficient measure of the true contributions of research. Achievement of this objective will be determined, ultimately, by the judgment of public health workers who read and, most importantly, use the results of the students' investigations.

Recent years have been characterized by big health problems, such as AIDS, that have demanded much of the time and attention of public health department personnel. Given the current financial constraints, there is a danger that State and local health departments will have little time to do research beyond the big concerns, such as AIDS and those acute outbreaks that are clearly hazardous to a significant number of persons. There may be no time to study the health effects of a sudden exposure to hyperfluoridation, or an increase in the reporting of pharyngeal gonorrhea in young children, or the reasons why influenza behaves differently in different nursing homes. There may be even less time to explore the health effects of a hurricane or of a change in smoking policy in a large company. Rapid response teams, in fact, have taken over at exactly these points, enabling subacute, as well as acute, problems to be investigated and better understood and permitting in-depth study of "natural experiments" that appear, such as hurricanes, hyperfluoridation, and changes in smoking policy. It is this level of field epidemiology, the "next layer of the epidemiologic onion," that is in danger of being neglected due to lack of resources, and it is here that student-faculty-health department teams can make a significant scientific contribution.

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System change. The final objective is to increase the number of public health workers who understand the purpose and process of investigating disease outbreaks. Several graduates of the program are working in State and local health departments around the United States, and several others are working in health-related institutions, including hospitals, clinics, and public agencies. Not only those graduates who became practicing epidemiologists, but also those who become administrators of institutions and directors of agencies, will recognize the potential benefits of epidemiologic investigation and make timely requests for epidemiologic consultation.

If other schools of public health or departments of preventive medicine wish to establish similar

programs, their faculty members need to consider several issues. This program, with 15 students and 4 or 5 investigations each semester, required the equivalent of one full-time faculty. It is important for a faculty member to work with health department staff as well as with students to assure adequate communication between university and health department investigators and to assist with the transition of the work load when an investigation continues beyond the end of the academic semester.

When the findings of investigations are developed into manuscripts for professional publication, a faculty member is likely to be a coauthor and, because students graduate and leave the school, will be primarily responsible for coordinating communications between journals and coauthors.

A RRT program requires support from the entire faculty and administration of a school. When it is necessary to respond to a request for an investigation of an outbreak, students at Yale are allowed to miss classes or postpone assignments. Although this was seldom necessary, programs at other schools should establish such guidelines, which will need the support of the faculty and administration.

A major reason for the success of this program in Connecticut was the enthusiastic support of State and local health department personnel and their willingness to work with student-faculty RRTs. To have this support is essential.

The financial resources needed to support this field investigation program are moderate. In addition to the salary of one faculty member and associated office space and clerical support, the costs for this program included mileage reimbursement for travel (no overnight stays were required), telephone (which averaged approximately $100 per month), and data processing expenses. On several occasions the CT-DHS provided assistance with entering data for computer analysis at no cost to the RRT program. And, for a telephone survey of two communities, one of which was experiencing an outbreak of giardiasis, the CT-DHS allowed a rapid response team to use a State telephone credit card because all survey calls were long-distance from Yale.

Conclusions

Practical experience in field epidemiology is as important to train public health professionals as practical experience in health care delivery is to train physicians and nurses. The RRTs can be thought of as epidemiologic clerkships available to students enrolled in a school of public health. Experience from the first 2 years of this program supports the following conclusions:

1. With proper faculty supervision, and with support and cooperation of State and local health departments, student-faculty RRTs are feasible and become extraordinarily effective learning experiences for public health students.
2. RRTs can augment the resources and capability of health departments to investigate outbreaks of disease and natural experiments to an extent that otherwise would have been impossible.
3. The scientific contributions of RRTs can be significant, particularly in probing more deeply into outbreaks and natural experiments that would otherwise be impossible for local and State health agencies in an era of tight public resources.
4. It should be feasible to adapt the RRT model to other schools of public health and to many medical schools.

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